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tent of fourth belt. (Perhaps *P. ponderosa* as well).

14. Jimson weed (*Stramonium* sp.)—Fourth belt.

15. Mountain mahogany (*Cercocarpus parvifolius*).—Fourth and fifth belts.

16. Oak (*Quercus undulata* var. *gambellii*).—Fifth belt, below but near top of ridge.

17. Thornless chaparral (*Fallugia paradoxa*).—At top of ridge, fifth belt, forming a thick chaparral on north slope.

It should be mentioned, as a possible explanation of the higher altitude at which the scrub oak, hackberry, etc., were found on this slope than on the western slope, that in the ascent the course of a stream was followed about to the third belt.

Notes on the fauna of the Organ Mountains.—Mammalian fauna: The range contains a wide and varied extent of country, particularly between its northern widened portion and Soledad cañon. Of the larger mammals, there were formerly, as reported by hunters, elk, mountain goat, mountain sheep, and bear. These are not known to exist there at present, but Mr. G. R. Beasley, of Soledad cañon, is reported to have killed a full-grown male mountain sheep two years ago in the Organs. There are said to be some bears at the present time in the more inaccessible portions of the range, but this is not positively known.

There are known to exist at the present time: Deer (probably the black-tailed, *Cariacus macrotis*); mountain lion (*Felis concolor*); wild cats (*Lynx* sp.); red and silver foxes (*Vulpes* spp.); skunks (*Mephitis* sp.); squirrels (*Sciurus* sp.); chipmunks (*Tamias gracilis* and other spp.); weasels (*Putorius* sp.); civet cats (*Bassaris* sp.); and raccoons (*Procyon* sp.). Bats and mice also occur. Antelope, rabbits, badgers, prairie dogs, coyotes, are found at the base or in the lower portions.

Avian fauna: Californian quail, tonto quail (*Ortyx* spp.), eagles, hawks, buzzards, owls, jays, woodpeckers, doves, mocking birds, orioles, whippoorwills, wrens, swallows, humming birds, and others have been noted in the range. Unfortunately specimens were not collected, so that no specific determinations can be given. Wild turkey are said to occur, but I have seen none. They were common in the range formerly.

Reptilian fauna: Rattlesnakes (*Crotalus* sp.), several species of harmless snakes, and several species of small lizards have been observed. The rattlers are more frequent on the plains at the base of the range. Frogs are also said to occur.

Fish fauna: There are no fishes that I know of, as the mountain streams are small and swift, and often dry, for a long season. In the Sacramento and White Mountains, about sixty to eighty miles north and northeast, there is fine trout fishing in the streams.

Insect fauna: Many species of insects abound, a large number being peculiar to the range in this region, i. e., not found on the mesa and in the valley to the westward. These, in most cases, feed on such plants and trees as are likewise peculiar to the range. The following are those species which feed on some of the principal plants, so far as I have observed them, arranged under the heads of the plants:

Sotol (*Dasyliirion wheeleri*).

1. *Thrincopyge alacris*—larvæ bore flower stalks.
2. *Hesperobænus* n. sp.—adults eat newly forming flowers.

3. *Thrincopyge ambiens*—larvæ bore flower stalks.

4. *Acmaeodera culta*—larvæ bore in flower stalks.

5. Moth—larvæ bore flower stalks.

6. *Lecanodiaspis yuccæ*—scale on leaves. Also on *Yucca baccata*.

7. Small weevil—bores in flower stalks.

Scrub oak (*Quercus undulata* var. *wrightii*).

1. *Andricus* sp.?—makes a woolly, reddish gall on leaves.

2. Another gall-fly—makes a fleshy leaf gall.

3. *Synergus* sp. and *Decatoma* sp.—the first makes a large apple-like and very hard woody gall on twigs, in which the second is apparently an inquiline.

4. Geometrid moth—larva feeds on foliage.

5. Several species of *Lepidoptera*—larvæ feed on foliage.

Hackberry (*Celtis occidentalis*).

1. *Pachypsylla venusta*—forms a leaf-stalk or petiole gall.

2. *Pachypsylla celtidis-pubescens*—forms a small circular gall on leaves.

3. *Cecidomyiid*—makes small round gall on leaf-stems.

Many carnivorous bugs and beetles abound in the range. Butterflies are more numerous than in the valley. There are bees, wasps and ants; dragon flies, many locusts, larvæ of gnats in the streams, including buffalo gnats (*Simulium occidentale*); and flies of many families, especially those of parasitic and creophilous or coprophagous habits. A single specimen of a peculiar large blister beetle (*Megetra vittata*) has been found in the mountains and nowhere else in this immediate region, but many were found higher up in western New Mexico. Tarantulas (*Lycosa* sp.), centipedes (*Scolopendra*), viñagrones or whip-scorpions (*Thelyphonus*), and true scorpions also occur.

Molluscan fauna: Quite a number of specimens of a snail have been found in several parts of the mountains about half way up the range. Prof. T. D. A. Cockerell, to whom I gave some of the shells for determination, writes me that they are undoubtedly a variety of *Patula strigosa* Gould.

In conclusion, it should be stated that the determinations of the plants mentioned in this paper were made largely by the Botanical Division of the U. S. Dept. of Agriculture, and by Mr. Walter H. Evans, now of that Department also. A few were made by Prof. E. O. Wootton, botanist of the N. Mex. Agr. College.

POTTERY ON PUGET SOUND.

BY JAMES WICKERSHAM, TACOMA, WASHINGTON.

THAT the reader may not be misled by the above headline, I hasten to say that there never was any aboriginal pottery made either on the Columbia River, Puget Sound or in the regions northward to Alaska. Baskets of such strength, firmness and texture were made, however, that the absence of pottery was not a hardship upon the Indians, for they carried water in baskets, and even boiled food in them by the use of hot rocks constantly dropped in the water. But what lesson, if any, can the ethnologist learn from the absence of pottery on this northwest coast?

Let us first look at the character of the civilization existing here prior to the advent of the white man and compare it with that of other localities—say San Francisco Bay, but a few hundred miles farther south on the same shore. The Indians of Oregon, Washington, British Columbia and Alaska made and constantly used the finest canoes in the world, capable of holding fifty or sixty men. They fearlessly pursued the whale on the Pacific Ocean, far out of sight of land; and fastening their harpoons to the monster by the use of inflated bladders, they caused him to float; and after his death he was towed by a line of great canoes to the shore; where, landing the huge carcass,

his captors feasted in truly Indian style. But a few hundred miles away the Indians of San Francisco Bay rode on a raft or bundle of reeds! The conclusion follows irresistibly that a different aboriginal civilization existed from the Columbia River northward to Alaska than that on San Francisco Bay. From a careful examination of the archæological remains it seems quite certain that the lines connecting the middle type of civilization of the Puget Sound region with other American civilizations lay—one up the Columbia and across to the Ohio region, and the other by way of the Snake River, Great Salt Lake and the Pueblo region, and connecting with the Mexican country. But in each of these regions—in Ohio and Mexico—we find pottery in abundance, but none in the Puget Sound basin. This cannot be on account of lack of material, for the finest potters' clay exists in great beds throughout this region on the surface, and many potteries now work it. What is the conclusion, then? It is that the high civilization of the Northwest coast did not come either from the east or south!

This middle type of civilization on Puget Sound made splendidly carved war canoes; the finest basket work in America; featherwork like the Aztecs; metallics like those of Moqui; wove blankets equal to the Navajo; worshipped the sun like the Mexican, and made stone gods equal in carving to those of Central America; as carvers of wood they have no equals in America; they were artisans skilled in carving, weaving and painting; they built permanent homes of great posts and cedar boards, exactly like the Mongolian tribes of Asia—exactly like the Japanese; their beds were arranged on each side of the houses on platforms in the true Mongolian style; their language yet preserves the identical tongue spoken by the Apache and other southern Athapaskan; many pure Aztec words linger north of Puget Sound—and yet they made no pottery!

No nation ever lost the art of pottery-making. The art never was known to the people of this northwest country; though they are cousins to the Algonquins and Aztecs and brothers to the Apaches, yet they had not the art possessed by these people of making vessels from clay. Not a trace of the potter's work can be found in the Columbia River or Puget Sound regions. Although these people are of kin, yet in this particular they are as distant as the poles. It follows that the Athapascans of Mexico learned the potter's trade after they left the early home of their kinsmen on Puget Sound; it also follows that the Apache and kindred tribes were migrants from the north, and it is true that the Algonquin was not a potter until after he reached the Mississippi valley.

It seems to me that one certain result follows from the known facts, viz.: That the Athapaskan tribes of Mexico, and possibly the Aztecs, migrated to Mexico from the Puget Sound region—for if our Athapascans came to the north from Mexico and settled in the Puget Sound basin, why did they not bring that most characteristic manufacture, pottery, with them? I take it that the conclusion must be conceded that the migration was southward, and not by San Francisco Bay, either, but via Great Salt Lake to Mexico.

Humboldt, Prescott and other eminent authorities place Aztlan, the ancient Aztec hiving place, in the Puget Sound region, and certainly the absence of pottery here is a strong additional fact in support of their statements. If, now, it be conceded that the hiving place of the Aztecs, Apaches and other southern Athapascans was on Puget Sound, may it not also be granted that this is some further proof of the Asiatic origin of the same tribes?

DISPOSAL OF WASTE AT THE WORLD'S COLUMBIAN EXPOSITION.*

BY W. F. MORSE, NEW YORK.

WHEN it was seen that the proposed World's Fair would occupy 600 acres of ground, have a resident population of thirty to forty thousand, and an average of one to three hundred thousand daily visitors, it was apparent that the sanitation of the grounds was a problem of some magnitude, and one that must be solved without the chance for an error, as after the opening there was no time for changes of plans.

For the drainage the Shone Hydro-Pneumatic System was chosen. This is an English apparatus, which receives, in tanks under the floors of the buildings, all the sewage from toilet rooms, and by compressed air automatically employed forces it into large tanks or reservoirs at one central station. The sewage is then precipitated by chemicals, the effluent run off into the lake, and the residuum pumped into presses which deliver it in solid cakes for disposal.

Besides this sewage sludge, the waste food products from restaurants and the refuse and litter of all sorts taken together would amount to a vast bulk of waste to be destroyed. There was no convenient place outside the grounds where this might be dumped, the lake was impracticable for the purpose; it must be burned, and this must be done on the grounds of the Exposition.

The Engle Sanitary Garbage Cremator was selected as the one which promised best results, and two large furnaces were built in the fall of '92. At the opening of the Fair the work of disposal of all garbage, sewage sludge, waste, refuse, manure and the bodies of animals was begun and has been carried on without cessation for six months. The results of this work give a better idea of the value of garbage cremation than any reports yet published.

The two furnaces used crude petroleum oil as fuel, atomized this by air, obtained the power from an electric motor, and with a pressure of twelve ounces of air and using six to seven gallons of oil per hour for each burner, obtained as high a degree of heat and did the same work which would be done by a steam burner using 120 lbs. pressure of steam and a much larger amount of fuel.

The sewage cake contained fifty-eight per cent of liquid, and of the remainder only eighteen per cent was combustible. The garbage contained water in large amounts, rising sometimes from sixty to eighty per cent. Because of the necessity of being always open for inspection, more men were employed than would usually be needed, thus adding extra expense.

There was at no time any discharge of odors, fumes or smoke from the chimney; the results of combustion (carbonic acid gas) were colorless and invisible, and being discharged fifty feet from the ground at a temperature of 1,000° were quickly dissipated.

The cost of labor and fuel was from sixty to seventy cents per ton, the sludge costing considerably more than the garbage. At other places where furnaces of this same type are employed, this cost has been brought down to eight to twelve cents per cubic yard, equivalent to twenty to thirty cents per ton.

The bodies of animals—four horses, two camels, cows, deer, elk, pigs, dogs, etc., were destroyed with ease and speed.

The Engle furnaces are constructed with two fires, the first or primary fire burning the garbage and waste by direct application of flame, the smoke, gases and fumes from this combustion being driven forward into a second

*Extract from paper read at World's Public Health Congress, Chicago, Oct. 10-14, 1893.